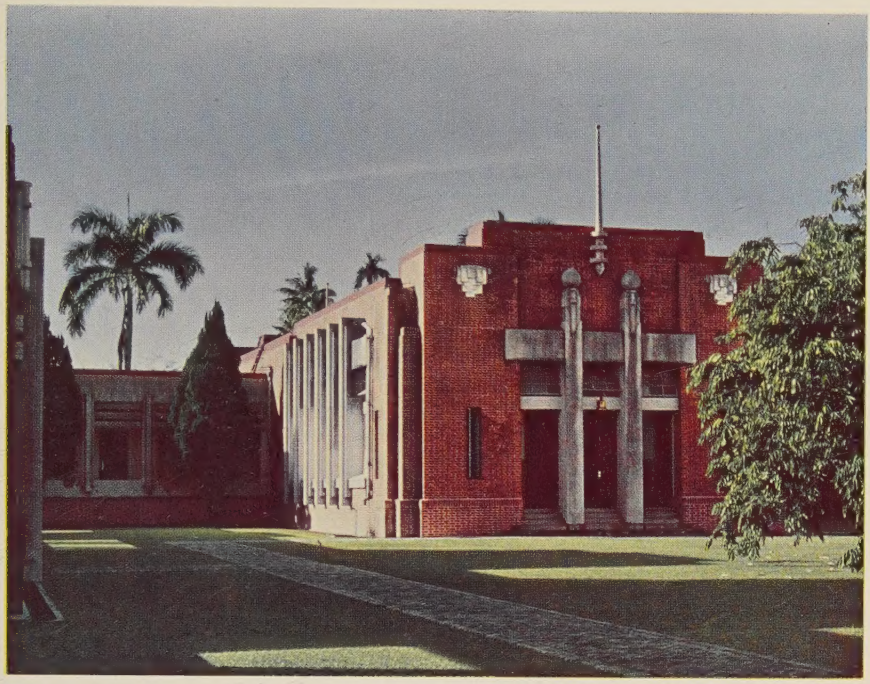
PLANTERS' BULLETIN

OF THE RUBBER RESEARCH INSTITUTE OF MALAYA



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R R I

LOCATION. The institute's laboratories and offices at the third mile, Ampang Road, Kuala Lumpur are open from 8 am to 1 pm and 2 pm to 4 pm on Mondays to Fridays, and from 8 am to 12.30 pm on Saturdays.

EXPERIMENT STATION AND FACTORY. This station of the R R I is situated 16 miles from Kuala Lumpur, at Sungei Buloh on the Kuala Lumpur — Kepong — Kuala Selangor road. Visits may be made on Mondays or Wednesdays by arrangement. There is a guest house.

CORRESPONDENCE. All LETTERS must be addressed to the Director, Rubber Research Institute of Malaya, Post Office Box 150, Kuala Lumpur. Special inquiries may be marked for the attention of particular officers. The address for TELEGRAMS is Searching, Kuala Lumpur. TELEPHONE: Kuala Lumpur 72051. PARCELS occasionally arrive without any indication of their origin. Senders' names and addresses should be written clearly on the outside of all packages, and advice of despatch should be given by letter or telegram.

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ADVICE. Inquiries are invited from rubber producers in the Federation of Malaya, the Colonies of Singapore and North Borneo, and the territories of Sarawak, Brunei and Nigeria, who may require more detailed information applicable to their own special problems. Where it is considered necessary, visits will be made to estates in Malaya as convenient. Visits to estates in other territories are by special arrangement. The only visits for which charges are normally made are those of our clone indentification inspectors. INTERVIEWS should be arranged by letter, as members of the senior research and advisory staff are frequently absent on visits to plantations.

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PLANTERS' BULLETIN

OF THE RUBBER RESEARCH INSTITUTE OF MALAYA

Kuala Lumpur May 1959 Number 42

Editorial: Classified and Special Rubbers

It is not perhaps generally realised that almost a quarter of Malaya's total output of rubber is sold to a technical specification. The major portion of this is latex concentrate whose production, following rapid expansion in the post war period, reached a record level in 1958. The specifications laid down at an early date for latex concentrate have ensured production of a high quality material which has nevertheless been improved, during the last year or two, by the introduction into our latex factories of the standards of cleanliness adopted by the milk industry.

Next in quantity comes technically classified rubber. It is true that the regular technical classification of a substantial quantity of No. 1 sheet is meeting the needs of some rubber users. At the same time we have been disappointed that producers have not found it worthwhile to classify the lower grades of natural rubber — so failing to meet the tyre manufacturer's contention that T.C. rubber is valueless unless the bulk of their purchases of lower grades is classified. Certain manufacturers operate private testing schemes designed to ensure that their rubber purchases are technically uniform, but such rubber is not included in the official T.C. scheme.

Superior processing rubber represents another effort by the natural rubber producer to provide the user with a raw material which will help him in his manufacturing processes: its use has grown rapidly during 1958 and now approaches 2,000 tons per year. SP rubber gives improved processing characteristics without sacrifice of physical properties and is particularly valuable for intricate extrusions, precision mouldings and similar work. All SP rubber produced is carefully tested for conformity to certain technical standards.

The introduction of superior processing properties into brown crepes is now under way and will give the user an opportunity to utilise an improved lower grade; we are also developing a concentrated form of SP rubber which can be mixed with any grade of rubber.

Other special rubbers made in Malaya include cyclised rubber, rubber powder and plasticised rubbers but their output is small. A recent development is partly purified rubber which is used as a raw material in the paint industry and has solved a difficulty in manufacture.

A small unit, an integral part of the British Rubber Producers' Research Association, has been set up in Great Britain to study the technical requirements of British rubber manufacturers through close contact

with their factory managers and technologists. In this way it is hoped to establish a channel for technical communication between user and producer and to keep the user fully informed of new developments in natural rubber.

All the rubbers discussed, with the exception of T.C. rubber and SP brown crepe, are premium grade materials which must necessarily cost more than the first-quality latex they are made from. There remains the large proportion of rubber which is sold according to the visual grading system. In time to come this rubber may be sold not on its appearance but on its technical properties. Already limits are set for the amount of copper and manganese that can be tolerated and suggestions have been made for inclusion of other specifications. We believe that additional technical requirements should not be grafted on to the existing grading system but should be included in an all-embracing system of technical classification. The customer is always right; if the user wants to buy his rubber by technical specification the producer must find ways of fulfilling the demand.

Nurseries: Establishment and Maintenance

THE COMMERCIAL VALUE of the produce of nurseries is a good indication of the amount of labour, materials and supervision which may be expended on them with worthwhile results. Valuation of the production of one acre — 25,000 clonal seedlings, 20,000 budded stumps or 10,000 yards of budwood — clearly demonstrates the ability of nurseries to carry the costs of intensive methods. At the same time the nursery has a special importance on the estate. One acre produces budwood sufficient for 400 acres of field budding or enough budded stumps or clonal seedlings for 100 acres of planting, so that the self-sufficient estate is justified in devoting great care to the establishment and maintenance of nurseries. The outstanding worth of the budwood nursery is apparent; although two years are required for establishment, it will then readily maintain production for four or five years and from one acre will provide material for more than 2,000 acres of field budding.

Early decision on planting programmes and planting material is a pre-requisite for the sound development of nurseries. As seedfall and planting season are relatively fixed features in the calendar, late decisions may impose a severe penalty in the form of high expenditure on planting material. While there is much scope for variation according to individual preferences, the outline which follows is limited to well tried practices which should be suited to most conditions.

CHOICE OF SITE

Nurseries deserve the best an estate can offer in the way of soil and site. Convenience of location in relation to field planting should not be disregarded but, since budwood or stumps can be transported fairly easily, suitability for growth of rubber plants must be the first consideration. A level site is desirable because of the intensive cultivations required and the need for economy in mechanising them. For similar reasons a free working loamy soil is preferred. A soil of high clay content can make cultivation difficult. On the other hand a sandy soil is readily cultivated but seedlings will be susceptible to drought and excessive watering may be entailed. On the whole a sandy soil is to be preferred to a clay soil for nursery work.

The third important site characteristic is a convenient source of water. Water will be required for germination of seeds and should be available for application to seedlings when drought follows planting. Overhead irrigation systems may well be a worthwhile capital investment for nursery work when site and season combine to aggravate drought. A case in point is the occasional necessity for using February seedfall in Malaya.

PREPARATION OF THE LAND

Intensive cultivation of nursery land has two objects, the production of a fine tilth to receive the germinated seeds and the destruction of the weed population. With the latter aim in view, working of the soil should start at least two months before planting. In this way weeds can be stimulated to develop and then killed by successive cultivations, before the planting of rubber seedlings restricts operations to expensive rounds of hand weeding. A sequence of ploughing and disc- and tine-harrowing gives a satisfactory tilth but in a small nursery a rotary cultivator may be easier to handle and will reduce the number of operations.

The last cultivation before planting provides the opportunity for the thorough incorporation in the soil of an initial dressing of rock phosphate and magnesium limestone which will be enough for a twelve month period. Rates of application are:

Christmas Island Rock Phosphate — 5 cwt per acre or 2 oz per sq. yd

Magnesium Limestone — 1 cwt per acre or 2/5 oz per sq. yd

TIME OF PLANTING

As seed must be fresh when sown, nursery planting must fit in with seedfall and preliminary cultivations should be completed in good time. On the average in Malaya therefore, nursery planting will be practicable between August and October and perhaps in February. The advantage of planting only in the limited season when seed and wet weather coincide is apparent but short supply of seed may necessitate planting in dry weather and reliance on artificial watering.

GERMINATION AND PLANTING OUT

Germination beds must be shaded from sunshine. They should be made of material which will hold moisture in contact with seeds but allow free drainage of excess and for this reason are built up to a height of at least 6 in. above their surroundings. Free working loamy soil, coir dust, sand or weathered sawdust are suitable materials. A width of 1 yard allows for convenient working and each square yard of bed will accommodate on an average one thousand seeds.

Seeds are spread out in a single layer and are pressed into the bed with the flattened faces downwards. The placed seeds can be covered with strips of coir matting, sacking or the material of the bed and thereafter the beds are watered regularly twice daily. From about the fifth day, beds are inspected daily for germination and all seeds which show the first signs of root development are removed for planting out. The importance of planting out at this stage deserves special emphasis: the seedlings are more easily handled with the minimum risk of damage to root and shoot and they carry reserves of moisture and nutrients which permit the tap root to penetrate quickly to moist levels in the soil. The seedling does not suffer excessive losses from transpiration if transplanting is completed before the shoot develops. We recommend that seed which has not germinated within 14 days from laying out in germination beds should be discarded.

Nursery planting is done simultaneously with lining and consists of dibbling in the germinated seeds, flattened faces downwards, at the appropriate spacing. It is a simple and rapid operation provided that preliminary cultivation has been well done.

SPACING

Nursery spacing will be determined by purpose and may be influenced by the value of the material available and by individual preference. In the Table below we suggest suitable spacings for clonal seedlings, stocks for production of budded stumps and stocks for a permanent budwood nursery; we also indicate the initial and ultimate stands, making some allowance for inspection paths, and the degree of thinning necessary.

Material	*Planting distance*	*Initial stand per acre*	*Proportion thinned*	*Final stand*
Clonal seedlings	1 × 1 ft	40,000	33%	26,000
	or			
	18 × 8 in.			
Budded stumps	1 × 1 ft (omitting every 4th row)	32,000	33%	21,000
Budwood	4 ft × 9 in.	14,500	50%	7,500
	or			
	3 ft × 12 in.			

A high initial stand favours weed control by the more rapid development of shade and, more important, permits thinning as a means of selection for vigour. The provision for this purpose in the Table should be regarded as the minimum. Vigour is a character readily assessed in the nursery and selection for vigour of either clonal seedlings or stocks for budding has been established as a method of securing good growth and early maturity in field plantings.

THINNING OUT

In rubber growing we want to take full advantage of the variability in seedling populations by selecting the most vigorous in the nursery. This, rather than the need to provide a margin for accidental losses, is the reason for the wide difference between initial and final stand in the Table above. The advantage of uninterrupted growth and the full benefit of fertilisers and space should be obtained for the final stand by applying a bold, systematic thinning routine at the earliest possible stage.

We suggest that thinning be done in two stages at four and six months from planting. Size of plant is the first consideration in thinning out the required proportion but reasonable spacing must be maintained. A 33% thinning is the minimum proportion which we recommend for elimination in clonal seedlings. By removing weaklings, early growth of the remainder will have a high degree of uniformity and all material suitable for field planting can be pulled at one time. The common practice of maintaining high stands of clonal seedlings in nurseries up to maturity and then pulling stumps selectively as they reach set standards at intervals is to be deprecated as it results in a distinct grading of material planted out. Areas planted with stumps which are second or later pullings from a nursery are likely to be below the standard for plantings of good clonal seedlings.

Similarly, with budded stump and budwood multiplication nurseries there are notable advantages in rigorous selection for vigour and in uniformity of material which enables budding to proceed smoothly with minimum waste of effort. The higher allowance for thinning in multiplication nurseries recognises the advantage of a high initial stand to provide shade and combat early weed development. Suitable seed for budded stocks is usually readily available and the cost of the high allowance is small in relation to the advantage gained. Use can sometimes be found for discard material which will justify a higher initial stand in establishing a budwood multiplication nursery.

WEEDING

Control of weeds is of first importance in the maintenance of a newly established nursery and rounds of weeding should be regular and thorough. Weeds will flourish under the ideal growing conditions of a well cultivated nursery and eradication is expensive because care must be

taken not to damage the young rubber seedlings. The high cost should be accepted and efficient weeding regarded as essential to secure for the rubber seedlings a rapid early growth which in turn limits the period of expensive upkeep. During weeding rounds, pruning of all double shoots should be undertaken.

MANURING

Manuring with soluble fertilisers should commence one month after planting. Provided that rock phosphate and magnesium limestone have been incorporated in the soil before planting, further manuring during twelve months after planting should be with a mixture containing 9 parts of sulphate of ammonia and 1 part of muriate of potash. Applications at 1, 3, 5 and 7 months after planting may be required, depending on the natural fertility of the soil. The need is determined by growth and general condition of plants.

If, for any reason, rock phosphate and magnesium limestone have not been applied before planting, complete mixtures, including magnesium, should be used for all post-planting applications. Mixture magnesium 'M' is recommended for sandy loams, loams and clay loams and magnesium 'X' for very sandy soils.

Fertilisers are applied at the rate of 1 oz of the sulphate of ammonia/muriate of potash mixture or 2 oz of complete mixture per running yard. In nurseries planted at 1 × 1 ft the mixture may be applied more or less evenly over the whole area. When planting is 18 × 8 in. or as described for stocks for budding, the first application at one month should be limited to a 6 inch band on either side of the planting row; subsequent applications can be uniformly distributed over the whole area between rows. For budwood multiplication nursery spacing, the first and second manurial applications at 1 and 3 months should be on strips extending respectively 6 in. and 12 in. on either side of planting rows. All later applications may be distributed uniformly over the whole planted area.

Budwood multiplication nurseries deserve generous manuring throughout their productive life and mixtures M or X, with magnesium, according to soil type, should be used for manuring after nurseries are budded. We recommend application at the rate of 4 oz per square yard, or approximately 10 cwt per acre, as a routine practice six months after cutting back of stocks or harvesting of budwood. Manuring should not be undertaken less than three months before stocks are budded or budwood is cut.

Synthetic Rubber

The statement in the press that the new 'synthetic natural' rubbers have the same qualities as the natural product is to the best of our knowledge substantially true, but we need more evidence for the statement that they are easier to produce than natural rubber. Synthetic rubbers will be discussed in our next issue.

Manganese Deficiency

FOLLOWING EXTENSIVE RESEARCH work at the Rubber Research Institute on the development of symptoms of nutrient deficiencies on the leaves of rubber trees, it is now possible to diagnose deficiencies of most of the elements known to be required for healthy plant growth. Of these, the most prevalent in Malaya are deficiencies of the 'big three' — nitrogen, phosphate and potash — and of magnesium. Another deficiency which is being observed more and more frequently, particularly in certain areas, is that of manganese.

Compared with the other nutrients, manganese is required by rubber in quite small amounts but symptoms of the deficiency appear fairly readily. Typical manganese deficiency symptoms are illustrated here in progressive stages from left to right.

On young trees, the characteristic signs are more often seen on the lower leaf storeys although they do occur on the younger whorls. Mature rubber shows the symptoms on the fully developed leaves over the whole tree.

The symptoms of manganese deficiency should not be confused with those of magnesium deficiency which were illustrated in an article in *Planters' Bulletin 31*. When magnesium is lacking, the chlorotic areas spread between the veins from the margin of the leaf inwards, whereas manganese deficiency produces an overall paling with bands of green

tissue outlining the midribs and lateral veins. Diagnosis of manganese deficiency, like that of most other mineral deficiencies, can be confirmed by analysis, the amount of manganese in the leaf being related to the appearance of visual symptoms of inadequate supply. Levels of manganese in the leaf below 50 parts per million indicate a deficiency in both young and mature rubber trees.

The manganese status of Malayan soils has not been investigated fully. The only published information has shown that manganese is not likely to be present in amounts toxic to the plant. Symptoms of manganese deficiency seem, however, to occur mainly on certain soils in Johore, although they can be seen in other parts of the country including the R.R.I. Experiment Station at Sungei Buloh in Selangor.

In other parts of the world, manganese deficiency is well known and is the cause of such maladies as 'grey spot' in oats (the classical example), 'marsh spot' in peas, 'Pahala blight' in sugar cane and several others. A common cause of the deficiency in these cases is alkalinity of the soil, making the manganese already present unavailable to the plant. In Malaya, with its acid soils, this process is unlikely to occur and further research is required on the manganese 'deficient' soils before the effects can be fully explained.

Little is known at present of the effects of manganese defficiency on growth and yield of mature rubber trees in Malaya. It seems likely that if the leaves are chlorotic, their functioning will be impaired, resulting in some decrease in growth and yield. Definite increases in yield have been claimed in Vietnam from applications of manganese to rubber trees.

More information is available for young rubber trees since these are much easier to grow under controlled conditions. Most of the experimental work at the R.R.I. has been carried out on young trees and it has been shown conclusively that growth is severely retarded when all essential nutrients except manganese are supplied in ample quantities.

It is not yet certain whether particular clones are more susceptible to manganese deficiency than others although, from experience on other crops in other parts of the world, this would be expected. The symptoms have been seen in Malaya on a number of clones but Tjir 1 seems to show them more readily than others.

Trials at the Experiment Station have shown that the symptoms of manganese deficiency can be alleviated by applications of manganese sulphate to the soil. This method is recommended because it is more convenient than spraying the leaves or injecting manganese into the trunk of the tree.

There is still insufficient information on the response of mature rubber to applications of manganese sulphate to permit a general recommendation to be made for every case of manganese deficiency. The symptoms were cured at Sungei Buloh by applying 4 oz per tree but there was some evidence that this rate was a little too high. Investigation of the problem continues. Manganese sulphate can be mixed with ferti-

lisers by the suppliers at a current cost of about 80 cents per lb. Adding the manganese sulphate to the fertiliser, which is applied at the usual rates, ensures that it is spread evenly over the ground and that each tree receives the correct amount of manganese.

If the visual symptoms described here are present and manganese deficiency is suspected, it is advisable to send leaf samples for analysis to the R.R.I. These samples should be taken by the methods described in *Planters' Bulletin 38* page 114 and sent to the Institute as quickly as possible.

Foreign Exchange Clones—1954 Collection

In 1954 an agreement was reached between the various rubber research institutes in the Far East to exchange their most promising new clones. Each institute agreed to forward twenty clones to each of the other institutes.

The Rubber Research Institute of Malaya supplied clones RRIM 501, 511, 513, 519, 526, 527 and fourteen of the 600 series clones. Clones received in exchange, and a few foreign clones received at an earlier date, are listed in the Table below:

From R.R.I.C. Ceylon		*From I.R.C.I. Indochina*		*From A.V.R.O.S. Sumatra*		*From C.P.V. Java*	
RRIC	1	OY	1	AVROS	308	WR	101
	2	IRCI	1		385	GT	1
	3		2		427	PR	226
	4		3		529		228
	5		5		1060		231
	6		6		1126		247
	7		7		1191		248
	14		8		1279		249
	16		9		1328		250
	17		10		1349		251
	21	TR	1406		1350		252
	22		1486		1447		253
	28		1512		1502		254
	29		1514		1518		255
	36		1548		1591		256
	37		1542		1712		257
	41		1555		1734		258
	42		1560		1735		259
	45		3363		1851		260
	51		3645		1907		261
Nab	12		3702		2012		
	15		3705		2037		
	17						
	20						

Some of the clones received are recommended for large or moderate scale planting in their country of origin; others are experimental clones which were considered promising in the light of yield records from a limited number of trees.

Budwood of these clones was received in Malaya in 1954-1955 and multiplied on the R.R.I. Experiment Station. In 1957 and 1958 five large scale trials were established, covering a total acreage of about 430 acres. In these trials the exchange clones, together with the most promising RRIM 600 series clones, are being tested with RRIM 501, PB 86 and PR 107 as controls.

Since we cannot expect informative results from these trials until a number of years have passed, we must depend for the time being on information from abroad.

To facilitate the choice for those who would like to use some of these clones on an experimental scale in their replantings in the near future, we summarise below our knowledge of the most promising clones. These clones were listed under Class III in 'Planting Recommendations 1959 - 60', *Planters' Bulletin 40,* January 1959.

CLONES FROM CEYLON

Clones Nab 12, 15 and 20 are recommended for small scale planting in their country of origin. Yields are expected to be of the same order as PB 86. Nab 20 is probably the most vigorous.

Of clones RRIC 1 – 7 the most promising are RRIC 5 and 7. Their yield in the original trial was about 20% more than that of Tjir 1.

Of the other Ceylon clones RRIC 22 is very vigorous, but very little is known about its yielding capacity.

CLONES FROM INDOCHINA

Clones IRCI 6 and 7 (the latter was not included in the exchange clones but was received at an earlier date) seem to be the most promising of the Indochinese clones recommended in their country of origin. Both are vigorous clones; the outstanding vigour of IRCI 7 was confirmed in a number of trials with trees not yet in tapping in Java, Ceylon and Sumatra. Yields are expected to be better than that of PB 86.

IRCI 10, like IRCI 6 and 7, has given high yields in the original trial in Indochina, but appears less vigorous and seems liable to wind damage.

The 'TR' clones are selections from one of the leading private companies in Indochina: information received from the I.R.C.I. indicates that clones TR 1486, TR 1542, TR 1548 and TR 3702 are the most promising. They are reported to be vigorous and have yielded up to 40% more than Tjir 1 in various trials.

CLONES FROM SUMATRA

AVROS 385 was originally selected because of its outstanding vigour, high yield in the later years of tapping and favourable secondary charac-

ters which include straight stem, small crown and insusceptibility to wind damage, pink disease and brown bast. The yield in the early years of tapping was low and it is therefore possible that the yield will not be high enough to justify the use of this clone in practice; it may, however, be a useful clone for breeding.

AVROS 427 has been planted on a fairly large scale in Sumatra since the war. The main characteristic is a yield which is high, sometimes very high, in the first two or three years of tapping. Thereafter, the yield nearly always drops and usually a high percentage of the trees develop brown bast or go dry. These observations have been confirmed in trials in Java and Indochina. The expectation is that with S/2.d/3. (67%) tapping the yield will stay at a high level, but this has not yet been proved. The clone needs a fertile, well drained soil, good upkeep and proper manuring. The girth is below average, stems are not straight, the crown is small. There is no danger of wind damage.

AVROS 1191 and AVROS 529 were recommended by AVROS for large scale planting in 1956. Growth of the young buddings of clone AVROS 1191 is vigorous but rather uneven; mature trees often lean and are liable to wind damage; yield can be very good. The bark is soft. This clone is susceptible to brown bast and tapping panel diseases, and should be tapped on a 67% system.

AVROS 1447, one of the promising newer AVROS clones, is recommended in Sumatra for small scale planting.

AVROS 1734 is a vigorous clone and a good yielder, recommended for moderate scale planting in Sumatra. The clone is very susceptible to pink disease.

AVROS 2037, another of the promising newer AVROS clones, has a good growth habit and is not susceptible to wind damage; it proved to be vigorous and high yielding in a number of trials.

CLONES FROM JAVA

WR 101 is recommended for planting on a large scale in Java. In three large scale trials, the yield in the 9th to 14th year of life was 162 – 176% of the yield of PR 107, compared with 129 – 154% for GT 1. In various commercial areas in Java yields of 2000 lb per acre have been obtained.

The girth of clone WR 101, especially in the earlier years of life, is slightly below or equal to that of RRIM 501. In this respect, however, the clone has a marked reaction to various methods of upkeep. The foliage is rather sparse. There has been no trouble with wind damage or pink disease in Java. The clone tends to be sensitive to brown bast and may require a less intensive tapping system.

The latex of clone WR 101 has a low d.r.c. and is unsuitable for centrifuging. A sometimes troublesome character is its below-average budding success, and the slow shooting of the buds.

Clones PR 226, 228 and 231 were vigorous and high yielding in pre-war small scale trials in Java.

PR 228 is probably the most vigorous clone and also most promising in respect of yield. PR 226 shows a very heavy branching and wide crown from the third year onwards.

In a trial in Sumatra PR 231 suffered a disastrous stem breakage; PR 226, and in lesser degree PR 228, are probably also liable to wind damage.

PR 247 – 261 were promising in small scale trials in Java. Of these, clones PR 247, 250, 253 and 257 were the most vigorous in large scale experiments, two years after budding.

CONCLUSIONS

At present the following clones seem to be the most promising of those listed under Class III of our 'Planting Recommendations 1959-60', published in *Planters' Bulletin 40,* January 1959.

first choice: WR 101, IRCI 7, AVROS 427

second choice: RRIC 5, RRIC 7, IRCI 6, AVROS 1734, AVROS 1447, AVROS 2037, PR 226, PR 228.

Further information is coming in regularly from abroad and the local performance of all exchange clones is being studied in trials established in Malaya.

Small quantities of budwood of the exchange clones are available from the Experiment Station, Sungei Buloh. The maximum order permitted is 5 yards of each clone.

Technical Classification of Rubber: Procedures in Common Use

This article supersedes a similar report in Planters' Bulletin No. 2, *September 1952*

INTRODUCTION

The scheme for Technical Classification of natural rubber, introduced after a comprehensive survey of the quality of production on Malayan estates, is the first successful attempt to assess rubber on a scientific basis before marketing. For producers, the main advantage of classifying rubber in this way is that it enables them to market material of uniform technical quality. Consumers of T.C. rubber are not only assured of this uniformity but are also provided with some useful, if limited, information on the probable behaviour of the manufactured product.

Under this scheme, rubber is divided into three classes — Red Circle, Yellow Circle and Blue Circle — according to the results of strain tests carried out on representative samples.

T.C. Testing

The strain test is done on every bale sample received, after vulcanising a portion of the rubber from the sample which has first been blended to make it homogeneous. All operations (blending of the sample, mixing of the ingredients, vulcanising and testing of the test pieces) have been carefully standardised. The strain value is the percentage stretch of the vulcanised rubber under a fixed load. Red Circle rubber stretches most and Blue Circle least; Yellow Circle rubber has intermediate properties. The strain test can be done in one of two ways: there is a 'normal' test which takes 3 days and a 'rapid' test which takes only about 3 hours. The latter is usually used for packing house samples and any other cases where results are needed quickly.

Systems of Classification

By taking samples regularly from the output of any estate it has proved possible to apply a control chart system to check that the properties of the rubber produced are maintained within definite limits. This system, known as '*quality control*', is applied to most Malayan estates and a typical control chart is shown in *Figure 6*. Marking of an estate's product with the symbol of given class is continued until tests show that strain values no longer fall within the limits specified for the class.

For packing houses, the above method is not possible since output is irregular and comprises separate consignments; a system of '*lot classification*' is therefore employed. Classification by lots can also be used to advantage for estates where quality of production varies to an extent which would make it difficult to apply a control chart system. The bales of each lot are kept separate and are only marked after the results of the tests on representative samples of the lot are received.

PROCEDURE FOR ESTATES USING THE QUALITY CONTROL SYSTEM

Initial Information

On applying to join the T.C. scheme, an estate is requested to send the following information to the test station:

1. The approximate daily production of each International Grade to be classified
2. The number of divisions and factories on the estate which can be considered as separate production units; if there is more than one such unit, the number of bales produced by each should be given
3. The tapping system(s) employed on the estate and the approximate acreage and type of rubber under each system

Depending on the answers to these questions, more information may be requested before a sampling procedure is recommended to the estate.

Initial Sampling Procedure

This is devised to establish both the level and the variability of the T.C. strain value of the output. The level decides the technical class but the variability must be small enough to permit classification. To give an accurate picture of the variability, the initial sampling procedure must cover all tapping tasks on the estate.

For estates, entirely or mostly on alternate daily tapping, bale samples should be taken as follows:

1. Samples from every bale produced on 2 consecutive days
2. Random daily samples on the basis of 1 sample for every 10 bales produced but not less than 2 samples per day, for a period of 2 weeks. Random sampling means that no conscious choice is made in the selection of the bales to be sampled and that every bale has an equal chance of being chosen

On this basis, estates producing on an average up to 24 bales daily would take 2 random samples every day; a production of 25 — 34 bales per day would require 3 daily samples; 35 — 44 bales, 4 samples; and so on.

Initial Results

Tests on initial bale samples can, broadly speaking, give one of three possible results:

1. The strain values are fairly uniform and fall within a single class. If so, bale marking instructions can be given and the sampling frequency reduced at an early date
2. The strain values may be outside the class limits; in this case, they can usually be brought within a desired class by suitable modifications in the method of preparing the dry rubber from latex
3. The strain values may vary in the course of time from one class to another and/or sometimes go beyond the limits. Bulking of latex, blending of sheets during packing, and in some cases changes in methods of preparation, should improve the uniformity of the rubber and bring it into a preferred class

In cases (2) and (3) the initial sampling stage has to be continued until production is sufficiently uniform to permit classification.

Other recommendations on factory procedure may be made to secure uniformity. In the rare instance where the estate's production is continuously very variable and suitable remedies cannot be applied, the estate may be recommended to withdraw from the scheme.

Normal Sampling Procedure

When the results show that bale classification can be permitted with sufficient confidence, the estate can reduce its sampling frequency. For normal sampling the same number of bales (i.e. 10% of the production

but not less than 2 bales per day) is randomly taken on each of two consecutive sampling days every week. To establish a routine it is best that this should be on two fixed days of the week, say Monday and Tuesday. These samples have to be dispatched to the test station *regularly every week as long as the estate continues in the scheme.*

If, in the course of time, the estate's production becomes too variable or a shift in the level of strain values brings the product into another class, instructions are sent for bale marking to be discontinued or for the classification colour to be altered. However, even when marking has ceased, bale sampling must be continued without interruption; it should be discontinued only when an estate withdraws from the T.C. scheme.

After any alteration in preparation methods or important changes in estate procedure, the estate may also be required to revert to daily sampling for some time. Such changes should be indicated either on the labels or in a covering letter.

PROCEDURE FOR ESTATES AND PACKING HOUSES USING THE LOT CLASSIFICATION SYSTEM

For estates using lot classification the initial sampling procedure is the same as for quality control. Thereafter, the number of bale samples required depends on the size of the lot to be sampled. The number of bales to be sampled is always a random 10% of the total number of bales, but not less than 2 bales.

Therefore, if the lot consists of:

2 — 24 bales, 2 samples are required
25 — 34 bales, 3 samples are required
35 — 44 bales, 4 samples are required
45 — 54 bales, 5 samples are required

Estates generally find it convenient to classify their production by weekly lots. Thus for estates producing 6 or less bales per day, the number of samples to be sent per week would be the same (4 samples) as if the estate were being classified under quality control. For estates producing more than 6 bales per day the number of bales to be sampled per week will be greater under lot classification (10% of total production) than under quality control (10% of 2 days' production per week).

Packing houses classify consignments as and when the occasion demands. Their dispatches are therefore irregular. When a packing house wishes to have a consignment technically classified, it is recommended that the sheets should be thoroughly blended during packing so that each bale will contain the same proportion of sheets from one source. This procedure, although not always practicable, reduces the variability between bales and thus the likelihood of the lot being unclassifiable. Samples should again be taken from 10% of the bales, chosen at random. (This is approximately one sample per ton of a lot of normal sized bales).

METHOD OF TAKING THE SAMPLE

A bale sample must be so taken that it is representative of the bale. Since the sheets in a bale may differ in technical quality a good sample must include a portion of as many sheets as possible: to ensure this, the procedure most widely used both for estates and packing houses is 'edge' bale sampling. Other sampling methods may be recommended for special circumstances.

Instructions for taking an 'edge' bale sample and repairing the bale are as follows:

1. Place the finished and wrapped (but untalced) bale to be sampled, so that the sheets are horizontal, i.e. parallel to the floor
2. Use a dry knife (a wet knife may cause mould inside the cut) to cut a piece of roughly triangular section down the entire length of one edge. The dimensions of the triangular section would be approximately 2 × 2 × 3 in. and for a 249 lb bale the length would be about 19 in. A 112 lb bale may be sampled in the same way, the samples being shorter in length. Pulling the cut portion away from the bale while the cutting is being done helps the operation, which is illustrated in *Figures 1, 2* and *3*
3. In order to repair the bale and bring it up to weight, spike wrapping sheets, equivalent in weight to the sample removed, over the cut corner of the bale. *Figure 4* shows a repaired bale, and a bag containing the sample taken

DISPATCH OF SAMPLES AND SAMPLE BAGS

Samples should be dispatched to the T.C. test station at R.R.I., Kuala Lumpur, without delay. For this purpose an adequate number of sample bags and labels are sent to estates and to packing houses when required. Each bag should contain only one sample with a label attached on the outside. The label should carry the following information:

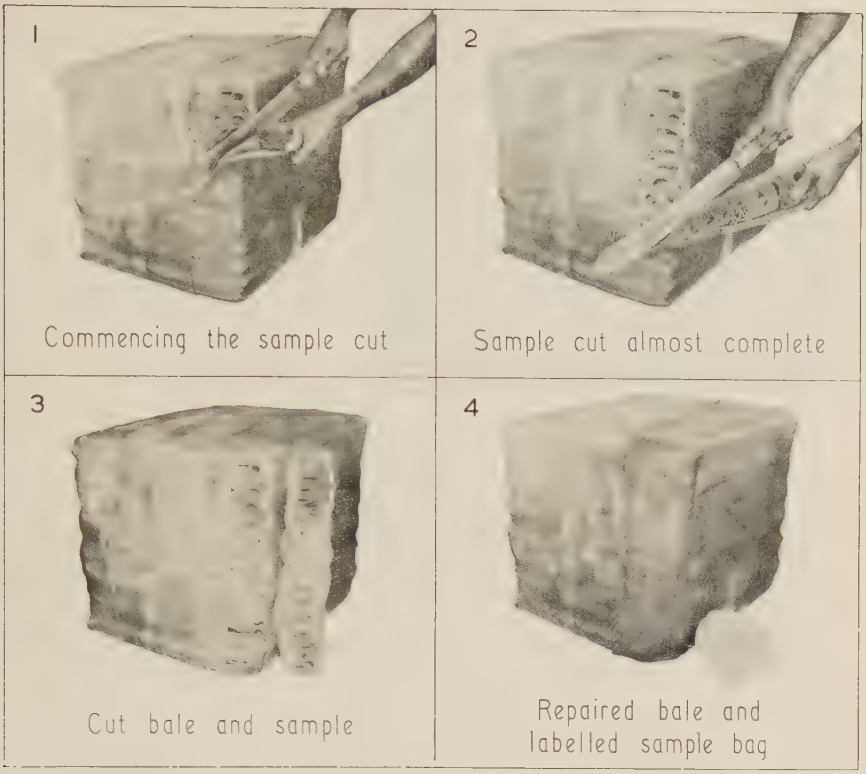
The name of the estate, division, or packing house

The date of harvesting the latex (estates only)

The date on which the sample was taken

For packing houses (and for estates on lot classification when special consignments are to be dispatched), the size of the lot from which bale was taken and the date of dispatch. In urgent cases the results can be sent by telephone or telegram within four hours of the receipt of samples at R.R.I., but this cannot always be guaranteed

For a medium sized estate, once it is on normal sampling (i.e. 4 samples per week) sufficient sample bags and labels are sent to bring the stock up to 30, as soon as it has fallen below 15. Estates are requested to keep records of sample bags received and dispatched by them.



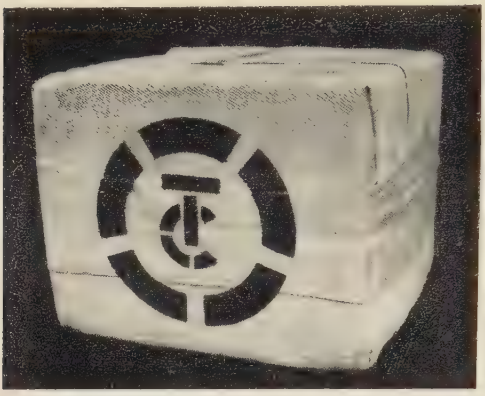
Figures 1 – 4. Procedure for edge sampling of bales.

INSTRUCTIONS FOR BALE MARKING

As soon as an estate or packing house receives bale marking instructions, all bales referred to should be marked with the T.C. monogram. A suitable stencil, stencil brush and an initial supply of stencil ink are provided by the testing station. Further supplies of stencil inks can be obtained from commercial sources; Messrs James Warren & Co. Ltd, Kuala Lumpur, supply a suitable water soluble ink. For marking Red Circle bales, a purple coloured paint is used instead of red in order to conform to the requirements of the Far Eastern Freight Conference.

The bale marking should be carried out as follows:

1. Apply a thin coat of bale coating solution to each bale, following normal factory procedure
2. When the bale coat is dry, lightly brush off any excess and then stencil the monogram and circle of the appropriate colour in the centre of two of the faces of each bale. The two faces should preferably be opposite each other. While there is no objection to other marks being superimposed on the T. C.



monogram it is of course desirable for such superimposition to be kept to a minimum. *Figure 5* shows the monogram stencilled on the face of a bale.

Figure 5. Bale marked with coloured circle and T.C. monogram.

CONTROL CHART

A typical T.C. quality control chart of strain results for 6 months is shown in *Figure 6*. The continuous horizontal lines show the 'producer' (i.e. marking) limits for Red, Yellow and Blue Circle rubbers.

Points on a vertical line give the T.C. strain values of the bale samples taken on a particular sampling date, the line joining these points (the vertical line) being a measure of the variability between bales. The short thick horizontal line represents the mean of the strain values for each day so that the shift in position of this line indicates the variability between days.

This particular chart shows that, after the initial sampling period, the estate's production was marked Yellow Circle from 4 January to 8 March. Marking was then discontinued since the strain values were drifting towards the Blue Circle class and was resumed with the latter symbol on 29 March. The production continued to be marked Blue Circle until 24 May, reversion to Yellow Circle having been recorded two weeks earlier. Even when the mean strain value goes outside the class marking limits, it will be seen that it is still within the 'consumer' (i.e. acceptance) limits for the particular class. After a short interval of 'no marking', bales were again labelled with the Yellow Circle symbol. The variability both between bales and between days shown on this chart is satisfactory. The coloured band along the date axis indicates at a glance the period of marking with the particular colour.

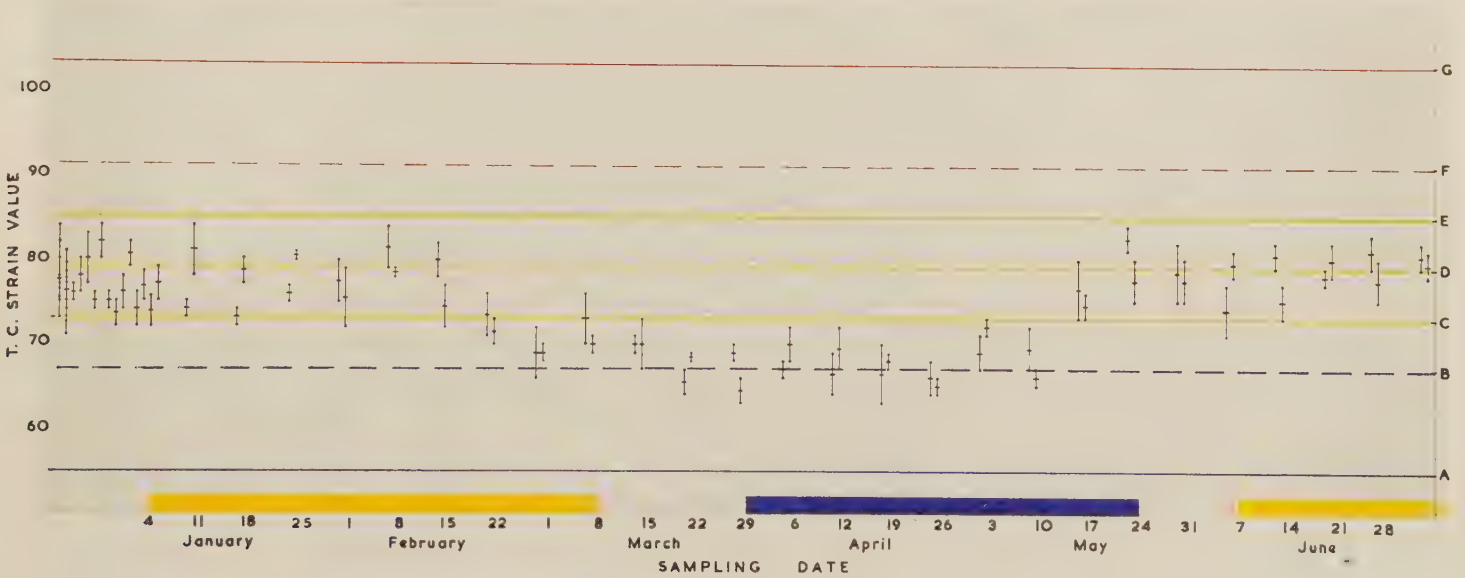
CONCLUSION: SOME POINTS OF SPECIAL INTEREST TO PRODUCERS OF T.C. RUBBER

In conclusion, attention is drawn to the following points:

1. All bale samples should be properly taken in accordance with the instructions given under the heading 'Method of Taking the Sample' on page 66
2. Sample from estates should be dispatched *regularly every week*. This applies even when bale marking has ceased

FIGURE 6. TECHNICALLY CLASSIFIED NATURAL RUBBER

YEAR..... CONTROL CHART (REDUCED TO HALF SCALE) .....ESTATE



MARKING PERIODS

PRODUCER LIMITS		CONSUMER LIMITS
A TO C	BLUE CIRCLE	A TO D
C TO E	YELLOW CIRCLE	B TO F
E TO G	RED CIRCLE	D TO G

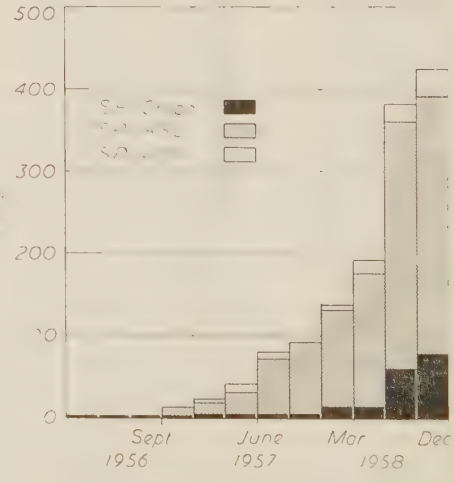
3. Only bales for which samples have been sent should be marked with the T.C. symbols and not other grades produced on the estates. For instance, if R.S.S. bale samples are sent for test, and the estate produces both sheet and crepe, only the R.S.S. bales (but not skimmings) should be marked
4. Each stencil plate is given for the exclusive use of a particular estate or packing house and should be used only for authorised bales
5. Estates are advised against entering into forward contracts for a special technical class of rubber as there is no definite guarantee that this class can be maintained for the required period
6. Maintenance of an estate's production in any of the three classes for as long as possible is more desirable technically than the attainment of a particular class

SP Rubbers During 1958

SP SHEETS AND CREPE

At the beginning of 1958, commercial production of SP sheet had only just started. In 1957, 200 tons of ribbed smoked sheet, 70 tons of SP crepe and 27 tons of air dried sheet were shipped from Malaya. For 1958 the figures were considerably higher, 900, 174 and 75 respectively. The diagram shows the steady growth in quarterly output of each kind of SP rubber — a consequence of the introduction of the new processes on an increased number of estates to meet growing demand. At the close of the year eight estates were actively making SP rubbers and the R.R.I. Experiment Station had ceased production. The present producing units are not at full capacity and potential users are therefore assured that Malaya will be able to meet bigger orders for SP rubbers.

Consumption has now climbed to a level of about 2,000 tons per year but we do not believe that this figure approaches the potential requirement. Our colleagues in Great Britain have circulated information upon the technological advantages of SP rubbers to most rubber users in the free world, and in the United Kingdom this has



Quarterly shipments of SP rubbers.

often been followed by visits to manufacturers and discussion with the technical men responsible. Advertisements are now appearing in the technical press. Increased demand in 1959 is confidently expected.

The destination of shipments during the second half of 1958 is of some interest. Figures are in tons.

	3rd Quarter	*4th Quarter**
Great Britain	74½	164
U.S.A.	155	61
New Zealand	45½	87
Japan	51½	35
Germany	31	25
Australia	7	30
South Africa	15	10½
Italy	2	8
Holland	4	–
France	1	6

The relatively large amount of SP rubber which has been shipped to such comparatively small consumers of rubber as New Zealand, Australia and South Africa is noteworthy. Consumption has been disappointing in European countries, notably France, and in Japan it is disproportionately low. No SP rubber has yet been shipped directly to communist countries.

SP BROWN CREPE AND SP 90

Many manufacturers have said that they would be extremely interested in SP rubbers if they were available in lower grades. They recognise the technological advantages which SP rubbers confer, but they are unable to use premium grade rubbers in their cheaper products. The R.R.I. has developed an SP brown crepe which is now undergoing commercial evaluation. Work is also in progress on SP 90, a concentrated form of SP rubber, which can be mixed with any grade or mixture of grades of rubber, natural or synthetic, to confer SP properties on the stock. It is hoped that these two new materials will reach a larger number of manufacturers during 1959.

Exemption of Special Rubbers from Australian Import Duty

We have been officially informed by Government that the rubber products listed on the following page have been allocated to Australian Tariff Item 330(A) (1). This means that under the Trade Agreement between the Government of Australia and the Government of the Federation of Malaya (White Paper No. 61 of 1958) the listed products will be allowed duty free entry into Australia on the same terms as standard grades of raw rubber:

* Revised figures

SP rubbers—crepe, smoked sheet, air dried sheet and SP 90 (a concentrated form of SP rubber)

High modulus rubbers—e.g. rubber coagulated at high d.r.c.

Softened rubbers—e. g. peptised rubber

Hardened rubber—e. g. treated by peroxide/amine

Anti-crystallising rubber—e.g. treatment with isomerising agents, e.g. thiol acids, sulphur dioxide, etc.

Purified or deproteinised rubber—e.g. coagulation of centrifuged latex at low d.r.c., and rubber from trypsin-treated latex

Rubber crumb or powder (unvulcanised)—e. g. comminuted crepe or scrap

Copolymers with natural rubber, in which rubber predominates—e.g. graft co-polymers with styrene, methyl methacrylate, etc.

To the above list must be added *cyclised rubber*, which is also allowed duty free entry under Tariff Item 369(C) (4).

We should like to comment that although the volume of exports to Australia of some of the above special rubbers is very limited and in some cases non-existent, the admission of these products to the duty free list is welcome evidence that they are now ranked with standard grades of natural rubber as raw material for consumption by industry. We hope that the Australian pattern will be followed by other countries when revising their Customs Tariffs.

Correspondence

ESTABLISHING LEGUME COVERS

'The article on the soil block method of establishing leguminous cover crops interested me. We, of course, have similar problems here, although I gather that the establishment of *Pueraria phaseoloides* and similar leguminous covers is much easier in Papua and New Guinea than it is in Malaya, perhaps because of the rather low phosphate status of many Malayan soils. We do not usually find it necessary to clear the ground completely of *kunai* [lalang] and other weed growth. Provided that a narrow lane is cleared to give the cover crop a start and the grass in the vicinity is slashed occasionally in the early stages, *Pueraria phaseoloides* is capable under most conditions of choking out even the most vigorous competitors.

However, a planter recently mentioned that he could establish legumes without even clearing a narrow lane in the grass by adopting a technique not unlike the soil block technique described in *Planters' Bulletin 40*. He has been starting seedlings of *Pueraria* in half coconut husks filled with soil and when the plants are well established, he puts these husks out with a stick about 3 ft long placed beside each. The young plant is able to root down through the husk and by the time it has grown up the stick it is able to send runners out over the grass which it then begins to smother. The planter claims to have given the system sufficient trial to be confident that it is fully applicable under his conditions.'

R.P. Dwyer, Director,
Department of Agriculture,
Stock and Fisheries,
Port Moresby, Papua,
New Guinea

The ease of establishment of legumes and their effectiveness in lalang suppression both vary considerably. Success with methods similar to that described in the first part of the above letter has been reported from parts of Borneo. Phosphate availability may well be the explanation. In

a recent experiment dressing the seed of four leguminous species with an equal weight of ground rock phosphate gave the following results after three months:

Part of plant	*Without phosphate*	*With phosphate*
	Weight in Grams	
	Average, 4 species	
Tops	*41.58*	*50.84*
Roots	*16.05*	*16.41*
Nodules	*2.73*	*3.24*
	Pueraria	
Tops	*38.69*	*53.75*
Roots	*18.44*	*18.56*
Nodules	*4.34*	*5.33*

These figures are the averages for several hundred plants growing under uniform conditions in pots. An intimate mixture of phosphate with the seed has resulted in a striking improvement in top growth, especially in Pueraria phaseoloides.

The improvisation of soil blocks with coconut husks shows how a good principle may be adapted to local needs.—Editor

Book Reviews

SIR HAROLD TEMPANY and D.H. GRIST. **An Introduction to Tropical Agriculture.** 1958, pp. 347, London; Longmans. 40s.

'Introduction' is a modest understatement of the contents of this review of tropical agriculture. It is not a text book for the new student of agriculture but a work of reference for those who are concerned with agriculture or rural development in the tropics: there is a very extensive bibliography.

Little detail on rubber production is to be expected in a work of this nature but the history of the rubber tree is used to illustrate improvement of a crop by vegetative propagation. The figure of 500 buddings per day by a skilled operator (p. 176) is exceptional in our experience; most Malayan planters are satisfied with about half this rate.

Such criticisms in our narrow field do not detract from the general value of the book although it is hardly a necessity for a practical planter conversant with the details of his own crops. L. R. D.

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C.L. MILLAR, L.M. TURK and H.D. FOTH. **The Fundamentals of Soil Science.** 1958, 3rd ed., pp. 526, New York; Wiley. London; Chapman and Hall. 60s.

This book is a product of the soil science department of the State University of Michigan and is intended as a college textbook for agricultural students; the general principles of the subject are therefore explained in simple terms, controversial aspects being generally omitted. The authors have adopted the modern view that 'Soil Science' is a science in its own right and the approach shows no chemical, botanical or other specialist bias. The subject matter has been kept well up to date by two revisions in fifteen years.

The book is well illustrated, there is good index and a very useful glossary of special terms; much information has been summarised in tables and diagrams but the text is somewhat lacking in references to original literature. The chief value of the book is in the lucid and concise way in which the various topics are treated and the logical order of their presentation. The following is a selection of the more important subjects discussed: chemical and physical properties of soils, classification of soils, soil reaction

and liming, soil organic matter and green manuring, fertilisers, nutrient requirements of plants, soil fertility and conservation.

Pains have been taken to make the text as readable as possible and for this reason, though tropical problems receive no special mention, it may be recommended to planters interested in the fundamentals of soil science. K.R.M.

R. R. I. News

Mr H.S. Blacklin, who has been Secretary of the Institute from 1 March 1932, retired from his appointment on 15 March 1959 after twenty seven years of devoted service.

After serving in the Royal Navy during World War I he came to Malaya in 1920 and worked as a planter on Narborough Estate and later as Manager of Bedrock Estate in Sungkai district of Perak. He also acted as Secretary to the United Planting Association of Malaya before joining the Institute.

During the Japanese occupation of Malaya he was interned in Singapore, and returned, immediately upon his release, to reopen his office in the R.R.I. in October 1945.

His duties as Secretary have covered a wide field and have called for those qualities of fair dealing tempered with sympathy and unfailing good humour which have endeared him to every member of the staff of the Institute and to the members of the Board.

'H.S.B.' will be always remembered with deep respect and affection; the best wishes of all those who have been associated with him in his work for the Institute go with him in his retirement.

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Mr A.G. Parker joined the staff of the Institute early in April. He has been seconded for two years from British Rubber Producers' Research Association, Welwyn, Hertfordshire, where he has been Librarian since 1956. He has previously held posts as Librarian at technical colleges in Watford and Cheltenham and is an Associate of the Library Association and also of the Institute of Linguists.

During his stay at the Institute he will review the entire work of the Library and, where necessary, modify its organisation to suit present day requirements.

The Library

The Library of the Rubber Research Institute of Malaya, now being reorganised, is administered as part of the Publications and Information Section.

The stock of literature amounts approximately to 4000 books and 5000 bound volumes of periodicals; in addition there are numerous bulletins, pamphlets and reports. About 300 current periodicals are received, from all parts of the world, dealing with rubber growing and processing and with allied sciences. The latest issues of these journals are on display in the library.

Enquiries on the literature of rubber cultivation and processing are answered.

Maladies of Hevea

Maladies of Hevea in Malaya by R.N. Hilton, with 41 coloured illustrations by Hoh Choo Chuan, will be available for distribution in May. A description of the book, together with an order form, is enclosed with this issue of *Planters' Bulletin.*

R.R.I. Lectures to Planters

This is a revised list of lectures available to Planters' Societies. When requesting a lecture, please name alternative titles and give the Director adequate notice of your requirement.

Soils Division

Observations on manuring of rubber based on results of field experiments
Current thoughts on ground covers in rubber areas
Recognition of nutrient deficiency symptoms shown by rubber and legume covers (evening lecture)
The absorption and translocation of nutrients by plants (evening lecture)
The use of herbicides for weed control

Botanical Division

Breeding and selection of RRIM clones
Planting material in practice
Tapping and stimulation of yield
Factors influencing the performance of hevea

Pathological Division

Root disease control and the role of fungicides
Diseases and injuries of the stem and branches (evening lecture)
Recognition of pests (evening lecture)

Chemical Division

Superior processing rubber
Latex concentrate production
General processing of plantation rubber
Synthetic rubber
Technical liaison between producer and consumer

Statistics

The statistical background to field experimentation
The choice of an appropriate statistical design for field trials

Advisory

The Estates Advisory Service and its work on field problems

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